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SCIENCE

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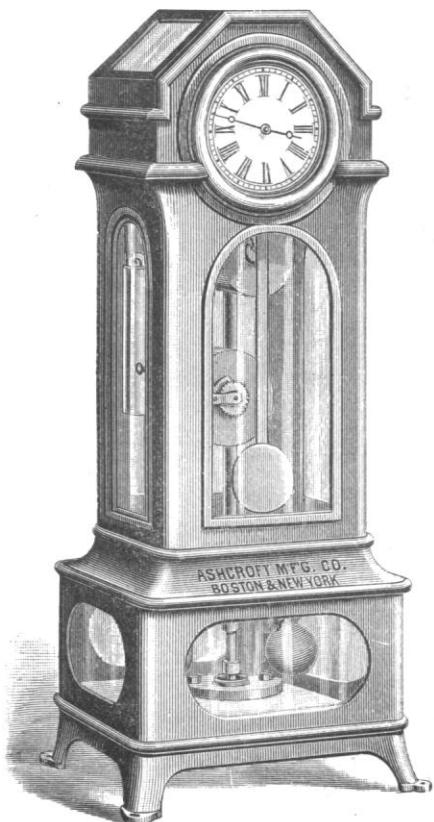
THE MOSCROP CONTINUOUS RECORDER.

THIS instrument was invented by J. B. Moscrop of Manchester, England, who designed it especially for the use of manufacturers of textile fabrics. Its services proved so valuable that its use rapidly extended, not only in Europe, but also in this country. It has found a place in many woollen and cotton mills, electric-light stations, and other places where it is desired to keep an accurate record of the time of starting and stopping an engine, as well as of all variations from a standard speed, with the exact time and extent of such variation.

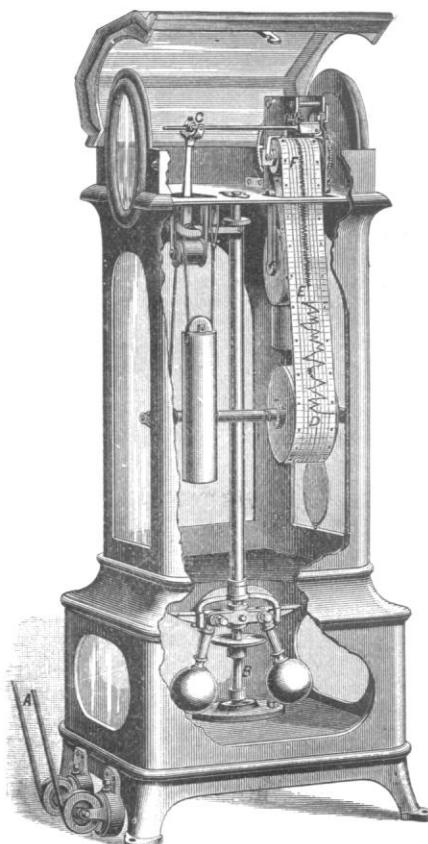
The instrument consists of an iron case with glass sides, con-

of the balls is transmitted to a horizontal arm at the top of the case. This arm carries a marker, which is movable across the paper band upon which the record is to be made.

When the engine is running steadily at the standard speed, the marker rests at a central longitudinal line on the paper. Sections of this paper are shown at Figs. 3 and 4. Should the speed of the engine be increased or decreased five per cent, the marker would pass to the next line to the right or left, each space passed over indicating a variation of five per cent in the speed. When the engine is stopped, the marker passes entirely off the paper, and makes no record until it is brought back to the paper by the starting of the



FIGS. 1 AND 2.—THE MOSCROP RECORDER.



taining an eight-day pendulum clock, which moves a continuous paper band. Upon this band the record is traced by an inked marker, which is actuated by the motion of the governor-balls as they rise and fall under varying speed. Fig. 1 shows the general appearance of the instrument, and Fig. 2 gives a side view with part of the frame removed, showing the clock-movement and the interior construction. The governor-shaft is actuated by the belt *A*, which transmits motion from the shaft whose speed it is desired to record to a pulley on the lower end of the upright shaft which rises through the middle of the instrument. To this shaft is attached a governor, the balls of which rise by centrifugal force when the shaft is revolved. By means of connecting devices, the motion

engine. As each transverse space on the paper indicates one hour, and as the paper is moved ahead at unvarying speed by the clock, the length of the interval between the starting and stopping of the engine is recorded, also the moment and extent of all variations of speed. One paper band is sufficient for a three-months' run.

Figs. 3 and 4 are copies of actual records taken from different engines, and taken together, show the workings of the instrument under different circumstances. The section marked 1 is almost perfection. The record begins at one minute past seven, and continues till 7.15; the narrow line showing plenty of fly-wheel momentum, and the straight line good governing. Section 2, 7.15 to

7.30, illustrates small fly-wheel combined with good governing. The fly-wheel unsteadiness is five per cent. Section 3, 7.30 to 7.45, illustrates great fly-wheel momentum, governing rather imperfect. Here the speed decreased one per cent by 7.45. As the decrease was gradual, the probability is that it was caused by the steam being down, and the governing not equal to the occasion. Section 4, 7.45 to 8, illustrates small fly-wheel momentum and imperfect governing. Here the speed suddenly increased two and

tions 13 and 14 are another instance of improved running. This engine has been speeded two and a half per cent, and yet never attained the speed it formerly attained during its oscillations. It is now always at its highest speed, combining steady turning with maximum turnout. If an engine is making 60 revolutions, and it proves to be oscillating in steadiness from 59 to 61, it is obvious that it is either running too quickly for good work at 61, or it is losing output when at 59. Sections 15, 16, and 17 are from the

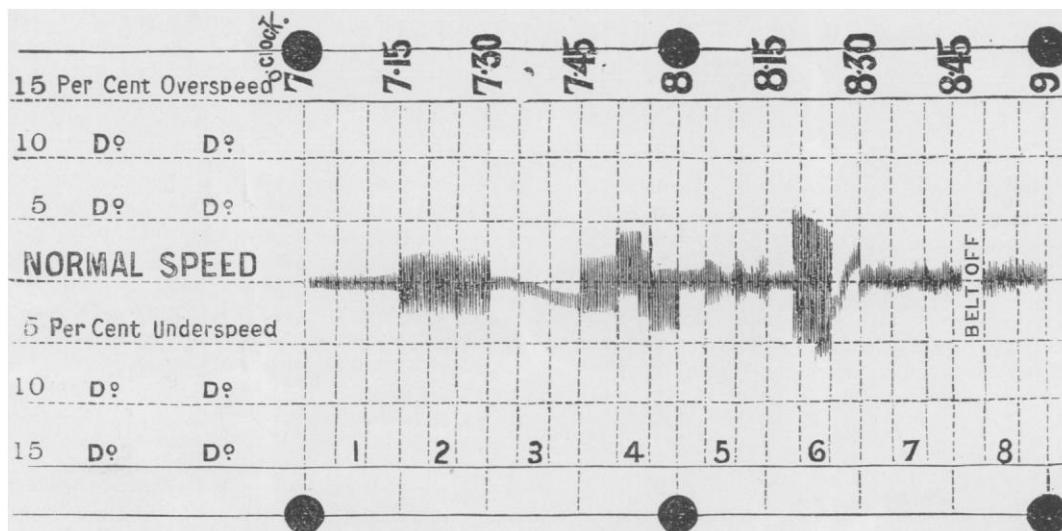


FIG. 3.—MOSCROP RECORDER RECORD.

one-half per cent at 7.50. This would appear to be, by its suddenness, a change in the load and governing not equal to the occasion. Section 5, 8 to 8.14, looks like mule-spinning and throttle-valve. Section 6, 8.15 to 8.30, is frequently met. Without doubt, the governing-gear began to stick at 8.18, the speed oscillating twelve per cent till 8.25. The oscillations have their ebb and flow in periods of a few seconds, and are the unsuspected cause of bad work. This is a good instance of an engine running its natural speed, yet

same engine, and are placed here to show vividly the advantage in steadiness of turning of having an engine lightly loaded. Section 15 is the record of full load, that is, 450 horse-power; section 16, the record with a partial load, that is, 250 horse-power; 17, with a small load, that is, 150 horse-power. This engine was fitted with a supplementary governor, recently patented, and it is worthy of note that it preserved its speed (automatic cut-off) under a change of load from 450 horse-power to 150 horse-power. It was sub-

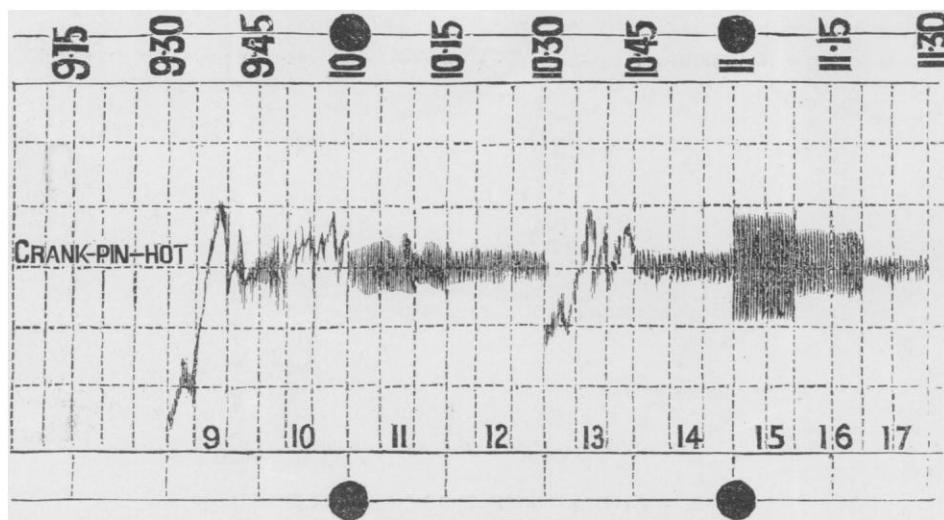


FIG. 4.—MOSCROP RECORDER RECORD.

being all the while dangerously unsteady, subjecting the weak part of the engine and gearing to a severe test. Sections 7 and 8, 8.30 to 9, illustrates respectable mediocrity. It is introduced to show that at 8.46 the record stopped through the belt being off.

As one of the objects in these illustrations is to make the reading of the records intelligible, we will now assume that the engine stopped from 9 to 9.30 for repairs. Sections 9, 10, 11, and 12 are diagrams from the same engine; 9 is the diagram when the recorder was first applied; 10, 11, and 12 are stages in the improvement in the engine's workings as the faults are remedied. Sec-

ected to a similar test with a varied pressure, giving equally good results.

The Ashcroft Manufacturing Company of this city have exclusive control of the Moscrop recorder for the United States.

A NUMBER of Spanish country teachers have gone to Madrid to make known the wretched condition of most of those to whom the education of the rising generation is intrusted, and to urge upon the government the necessity of including the teachers in the civil servants in the pay of the state.